85 2817

FOREST PEST MANAGEMENT
Pacific Southwest Region

Report No. 84-33

3430 Evaluation
September 6, 1984

A BIOLOGICAL EVALUATION OF FRASER FLAT AND HULL CREEK CAMPGROUNDS, MI-WOK RANGER DISTRICT, STANISLAUS NATIONAL FOREST

PSW FOREST AND RANGE EXPERIMENT STATION
JUN 11 1985
STATION LIBRARY COPY

John Dale, Entomologist
John Kliejunas, Plant Pathologist

ABSTRACT

One streamside (Fraser Flat) and one primitive (Hull Creek) campground on the Mi-Wok District, Stanislaus National Forest, were evaluated for pest problems that may affect management objectives for the sites. Fraser Flat campground was relataively free of pests. Annosus root disease and white fir dwarf mistletoe were the major pests at Hull Creek. Lodgepole pine needlecast was common at Hull Creek. Management alternatives discussed include maintain current direction, management of annosus root disease, management of dwarf mistletoe, vegetation management, hazard tree reduction, and integration of treatments.

INTRODUCTION

In response to a request from Blaine Cornell, Forest Supervisor, Stanislaus National Forest, we conducted a biological evaluation of Fraser Flat and Hull Creek campgrounds on the Mi-Wok District on May 24, 1984. We were accompanied by Mike Cook from the District.

The objective of resource management for these sites is to maintain or improve the existing outdoor recreational experience by, in part, minimizing insect and disease activities that affect stand dynamics of recreation sites. The objectives of the evaluation were to identify existing and potential pest situations, to provide information on the expected future conditions of each site, and to provide the Mi-Wok District with pest management alternatives for planned Environmental Assessments.

USDA, FOREST SERVICE, PACIFIC SOUTHWEST REGION
State and Private Forestry, Forest Pest Management
630 Sansome Street, San Francisco, California 94111

FRASER FLAT CAMPGROUND

Observations

General. This 17-year-old campground of 38 units (Appendix, Fig. 1) is located on a narrow flat along the South Fork of the Stanislaus River. Fishing is the primary attraction and accouts for much of the 43,000 visitor days per year. The areas within the loops are primarily wet meadows that keep most the foot traffic on the roads early in the recreational season. There are scattered trees along the river, and a few groves of ponderosa pine and incense-cedar remain within the loops. Most of the timber cover (stand type M3G), including a few Douglas-firs and white firs, is located outside the loops between units 39 and 17. The abundant stumps within the loops indicate that tree cover, mostly incense-cedar, was once more extensive. Giant sequoias have been planted as screening at some units, but there is a general lack of screening and barrier vegetation throughout the campground. The few woody shrubs present indicate that these and other shrub species could be more extensively propagated and maintained.

Diseases and Insects. This campground was relatively free of diseases and insects. True mistletoe (Phoradendron juniperinum spp. libocedri) was present in a 100 ft. tall incense-cedar behind unit 28. Dwarf mistletoe (Arceuthobium campylopodum) was found only in one large ponderosa pine behind unit 4, but the good foliage color indicated little drain on the tree. There are small brooms of unknown origin in the lower branches of incense-cedars behind the vehicle pads of units 6 and 15. No signs of Fomes annosus were found associated with any trees or stumps in the campground. There were no recent or current activity of bark beetles or defoliating insects.

Management Alternatives

The lack of forest insects and diseases at Fraser Flat indicates that preventive, rather than corrective, actions and policies should be sufficient to maintain the campground vegetation in a pest-free condition. These should include a program for identification and removal of hazardous trees.

1. Maintain Current Management Direction. Barring unforeseen climatic stress and camper impact, the vegetation on the site should maintain itself for many years to come. Annosus root disease appears to be absent and the dwarf mistletoe present is not in a position to spread to other pines. However, maintenance of the current healthy vegetation will not replace the missing shading vegetation represented by the many stumps, particularly those in the meadows.

2. Management of Annosus Root Disease. Fraser Flat is one of the few campgrounds examined by Forest Pest Management in recent years that appears free of this root pathogen, and it is highly desirable to keep the disease out. This can best be done by preventing basal wounding and by preventing infection of freshly-cut stumps. The probability of stump infection can be greatly reduced by the immediate application of borax

(sodium tetraborate decahydrate, EPA Reg. No. 1624-94) to all freshly-cut conifer stump surfaces created at Fraser Flat (see FSM 3205, 2331.33, R-5 Supplement No. 90).

3. Management of Dwarf Mistletoe. The one ponderosa pine with dwarf mistletoe is a large isolated tree behind unit 4. Therefore, ponderosa pine should not be planted within a distance equal to the height of the mistletoe plants above the ground. If additional trees are to be planted in the opening around this pine, only non-host species such as Douglas-fir, incense-cedar or white fir are recommended, in the order given. These tree species will provide cover and also provide a barrier to the spread of the pine specific species of dwarf mistletoe. This will preclude removal of the pine.

Removing dwarf mistletoe witches' brooms prolongs the life of the infected tree. However, the one ponderosa pine with brooms is in good condition and the brooms are well above the ground. Maintaining the isolation of this tree, surrounding it with planted non-host species, or removing it, would be less expensive and more applicable than pruning.

4. Vegetation Management. The objective of any pest management activity in the Fraser Flat area should be to promote the growth of a mixed species stand that is healthy and vigorous, all-aged, and properly stocked. Ponderosa pine and incense-cedar seem most suitable for the area, but white fir and Douglas-fir presently grow near the campground entrance. It may be possible to expand this diversity to other areas of the campground.

Native hardwoods could be planted in some of the open areas. They would provide cooling shade, may help dry out the wetter areas, and would provide barriers to the spread of annosus root disease should it be introduced. The presence of shrubs around a few units indicates the potential of producing and maintaining screening vegetation. Improved drainage within the loop interiors probably would benefit plant establishment.

Thinning does not seem necessary in any of the timbered areas, but dense aggregations should not be allowed to develop. Overstocking is a predisposing factor to insect attack and may enhance the opportunities for spread of root disease through increased root contacts between trees of the same species.

5. Integrate Treatments. Management alternatives are not mutually exclusive. They should be used alone or in combination in various parts of a campground. Consideration of the interactions among current and potential insect and disease problems of the area during the development and implementation of a vegetation management plan will result in the successful integration of pest management strategies and best meet management objectives.

HULL CREEK CAMPGROUND

Observations

General. This primitive campground (Appendix, Fig. 2) has occupied a very narrow plain along Hull Creek for 10 years. The family camping area (10 trailer spurs and 6 walk-in units) extends 2400 ft. north from the county road, and the group area (max. 13 cars, 2 buses) extends 1200 ft. to the south. Visitor use is about 4,200 visitor days per year. Tree species present include lodgepole pine, white fir, Jeffrey and lodgepole pine, and some sugar pine and cottonwood. Stand type is M3N. The presence of Jeffrey and lodgepole pines indicates a cold climate for the 5400 ft. elevation. Understory vegetation is sparse around use areas, but increases in less accessible areas. Small fuelwood sales are being used to reduce the stocking within the family area. The group area is presently closed for rehabilitation because of the camping impacts on the meadows and the deterioration of the understory vegetation.

Diseases and Insects. The most striking feature of the vegetation is the discoloration and needle loss of the lodgepole pines. Only the needles produced prior to 1983 are affected. Lodgepole pine needle cast (Davisomycella montana) was associated with these needles. A history of warm winter temperatures initiating growth and followed by cooler, normal weather indicates an abiotic stress factor associated with the needle cast.

Other disease problems noted were annosus root disease, dwarf mistletoe (A. abietinum f.sp. concoloris) on white fir, western gall rust (Endocronartium harknessii) and white pine blister rust (Cronartium ribicola). Fomes annosus was common in white fir stumps throughout the area. White fir dwarf mistletoe was common throughout the downstream half of the family area, but decreased in frequency in the upstream half. Dwarf mistletoe stem infections, with extensive associated decay, occurred frequently in the overstory white firs. Western gall rust was widespread on the lodgepole pines, but of low intensity and largely in the form of branch galls. Lethal white pine blister rust branch and stem cankers were present on sugar pine saplings.

Pine engravers (Ips sp.) killed a few lodgepole pines in 1982. The problem was minor unless the fuelwood cutting had removed additional kills. The fir engraver (Scolytus ventralis) killed several white firs along the creek and near the county road. All but the peeled bark had been taken for fuelwood.

Management Alternatives

Hull Creek can best be summarized as an area in need of rest and/or rehabilitation. This has been recognized by District resource management with the closure of the group camping area. Some of the downstream parts of the family area look little better than the group area because the public tends to camp in undesignated as well as designated areas. Thus, an allocation question arises, "Will improvements at Hull Creek

provide equal or greater benefits than similar investments in other, nearby camping areas?" The purpose of the biological evaluation is to provide information useful to this decision.

1. No Change in Current Management Direction. Abiotic factors such as drought and soil compaction have contributed to the vegetation deterioration at the site. The manager has no control over these factors and can only respond by manipulating the vegetation and thus the biotic factors contributing to deterioration -- annosus root disease, dwarf mistletoe infections, overstocking and associated insect attacks. The Mi-Wok District has responded to the overstocking problem through small fuelwood sales. This should decrease the potential for problems with pine and fir engravers. However, thinning without recognition of annosus centers and dwarf mistletoe infections will not properly address the impacts of these pests.

Annosus root disease centers will continue to expand as long as there are root contacts with surrounding live true firs. These centers may be more numerous than perceived because of the difficulty of detecting F. annosus in living true firs. White fir reproduction in these centers will eventually succumb to the disease and screening will be lost unless lodgepole pine and shrubs fill in. Trees with substantial root and butt rot will have a high probability of failure, especially during severe winter storms. When hazardous trees are removed or when blow-down occurs, new annosus centers may be created by infection of freshly-cut stumps and wounds from spores of the fungus.

Dwarf mistletoe in true firs may increase as the proportion of true fir in the stands increases due to loss of other tree species from stress factors and bark beetle attack. Dwarf mistletoe will infect understory white fir from the overstory source of infection and perpetuate the disease. Decay will develop in dwarf mistletoe bole cankers and create potentially hazardous trees. White fir in dense aggregations in annosus root disease centers may become severely infected with dwarf mistletoe because of reduced growth. Although presently at low levels, pine and fir engravers may contribute to an increase in mortality, particularly in trees weakened by root disease, dwarf mistletoe, or other factors.

2. Management of Annosus Root Disease. The most effective control for annosus root disease is prevention. Because the disease is common on white fir stumps throughout the area, the most appropriate policy now appears to be to discourage white fir regeneration and use fuelwood cutting to isolate remaining white firs within barriers of nonhosts. This would greatly reduce the probability of root contacts. Also, thinning within active centers may increase the tolerance of white fir to infection through increasing their rate of root regeneration and replacement. With discrimination against white fir, vegetation in and around annosus centers will convert to pines that are resistant to the strain of F. annosus on true firs. Hardwoods also could be favored or planted. Hardwoods decrease the impact of annosus root disease by providing barriers to root spread between susceptible conifer species, and may be less susceptible to blow-down. The use of shrubs -- including willow, Ceanothus sp., and other vegetation suited to the site -- for screening between units and for traffic management should also be

considered. The probability of the formation of new centers, and the resulting adverse effects of the disease discussed in Alternative 1, can be reduced by the application of borax to all freshly-cut conifer stumps (see FSM 3205, 2331.33 R-5 Supplement No. 90).

3. Management of Dwarf Mistletoe. Dwarf mistletoe can be controlled by eradication or by suppression. Cutting white firs from annosus centers in the downstream half of the family area should remove many of the firs infected with dwarf mistletoe.

Suppression of dwarf mistletoe involves minimizing the adverse effects while tolerating a low level of infection. Various suppression tactics are available for reducing the impact of dwarf mistletoe in recreation sites. Thinning and species diversity appear to be the best suppression alternatives.

a. Thinning. Thinning is already in progress via the fuelwood cutting. Marking for removal should be done to provide optimum growth and reduced stress of residuals, which will decrease the risk of attack by fir engravers. The greatest benefit would accrue to those white firs located sufficiently outside of annosus centers to avoid or minimize root contact with infected firs. White firs that respond to release will likely outgrow any dwarf mistletoe infection and will be more tolerant to infection by F. annosus. Noninfected trees should be favored as leave trees. The removal of all trees with Hawksworth 6-class dwarf mistletoe ratings of 5 and 6 should be considered. White firs with bole infections should be considered for removal. Although bole infections are not serious from the standpoint of spreading dwarf mistletoe, they will deform the tree, cause mortality in small trees, and may eventually result in open, decayed cankers as the trees mature; a situation which is often hazardous in recreation areas. Treat all freshly cut stumps with borax to prevent colonization by F. annosus.

Slash from white fir fuelwood cutting does not present a potential engraver problem because most of the material is removed and utilized by campers. The creation of slash adjacent to Hull Creek, but beyond the gathering inclination of the public, should be avoided between December and mid-July.

b. Encourage tree species diversity. A mix of nonsusceptible species in infested portions of the campground will provide a barrier to spread of white fir dwarf mistletoe. Enhancement of the present species mix should be encouraged.

4. Hazard Tree Reduction. White firs with dwarf mistletoe stem cankers with wide dead faces that contain rot should be cut. Cottonwood could provide a desirable shade and aesthetic component of future site vegetation, but must be kept on a short rotation to limit development of butt rot and/or large unsound limbs which can become hazardous. Slow-growing, sawtimber-size white firs within annosus centers are often unstable in high winds because of insufficient supporting roots. Pines and hardwoods are more suitable for these infection centers.

In addition to hazardous tree removal, attempts to minimize development of hazardous trees is necessary. This can include protecting residual trees from wounding during thinnings and education of public users to reduce their impact. Restricting vehicles to specified areas would decrease soil compaction and reduce tree stress.

5. Integrate Treatments. Pest management techniques for individual pests will not be completely effective in reducing tree mortality and maintaining recreational values if implemented without considering vegetation health as the goal, rather than as pest control. The objective of any pest management activity at Hull Creek should be to promote the growth of mixed species stands that are healthy and vigorous, all-aged, and properly stocked. Opportunities exist to maintain and enhance plant diversity and to limit competition, thus reducing pest impact.

Management alternatives are not mutually exclusive; they should be used alone or in combination in various parts of the campground to produce the results desired. Consideration of the interactions among all insect and disease problems present in the area during the development and implementation of a vegetation management plan will result in successful integration of pest management strategies.

APPENDIX

BIOLOGY OF PEST ORGANISMS

Following are summaries of the biology of diseases and insects causing mortality or damage in the areas evaluated.

Annosus Root Disease (Fomes annosus). Fomes annosus is a fungus that attacks a wide range of woody plants, causing a decay of the roots and lower bole and death of sapwood and cambium. All conifer species in California are susceptible to the fungus. Hardwood species are rarely damaged or killed. Infected pines are usually killed rather rapidly when the fungus girdles the root collar. In contrast, older true firs can survive infection for many years, although butt and root rot may become extensive, resulting in tree weakening and windthrow.

During favorable periods, the fungus forms fruiting bodies in decayed stumps, under the bark of dead trees, or in the duff at the root collar. The fungus becomes established in freshly cut stumps from air-borne spores produced by the conks, and then grows into the root system. True firs can also be infected by spores invading fresh basal wounds. The fungus then spreads to healthy roots of surrounding susceptible conifers via root contacts. In general, infections will cross from pine to true fir; however, rarely is the fungus observed to go from true fir to pine. Local spread of the fungus outward from a stump typically results in the formation of disease centers, with dead trees in the center and fading trees on the margin. These centers usually continue to enlarge until they reach barriers such as openings in the stand or groups of non-susceptible plants.

The fungus may remain alive for as long as 50 years as a saprophyte in infected roots and stumps. Young susceptible tree species often become infected and die after their roots contact old infected root systems in the soil.

White Fir Dwarf Mistletoe (Arceuthobium abietinum f.sp. concoloris). White fir is only host for white fir dwarf mistletoe. The pathogen is an obligate parasite that obtains its nutrients, minerals and water from the host.

Dwarf mistletoes are dioecious, perennial higher plants that produce seeds as their means of spread. In the fall of the year when the fruit falls from the stem, the seed is ejected upward and outward. The seed adheres to any surface it contacts. When the seed lands in the crown of a susceptible host tree, it adheres to a needle or limb and overwinters. The following spring it germinates and penetrates the limb. For the next 2 to 4 years the plant grows in the tree limb, developing a root-like endophytic system in the inner bark and outer sapwood. It then produces aerial shoots and in another 2 to 4 years produces reproductive structures.

Spread of dwarf mistletoe is limited to the distance traveled by the seed, which from overstory to understory is usually 20 to 60 feet, but may be as much as 100 feet if wind assists the seeds. A rule of thumb is that dwarf mistletoe can spread horizontally to the understory a distance equal to the height of the infection in the overstory tree. Because of the various limits to spread, such as height of the source plant, angle of discharge, wind velocity, stand density, etc., the actual spread rate through an even-aged stand is about 1 to 2 feet per year.

Incense-Cedar True Mistletoe (Phoradendron juniperinum spp. libocedri). The incense-cedar mistletoe infects only incense-cedar. Like dwarf mistletoes, the true mistletoes are obligate parasites, but they are generally less demanding of their hosts because they manufacture many of their nutrients and usually require only water and minerals from their hosts.

True mistletoes are propagated and disseminated by seed. The seeds are spread by birds that feed on the berries. A viscous coating and hair-like threads on the outer surface of the seeds attach them firmly to twigs and branches, where they germinate and infect host tissues. Aerial plants develop from the specialized root-like systems (haustoria) several years after infection.

The incense-cedar mistletoe causes negligible damage to its host, but occasionally can build up to high populations and weaken older trees.

White Pine Blister Rust (Cronartium ribicola). White pine blister rust is an obligate parasite that attacks sugar and western white pines and several species of Ribes in California. The fungus needs two hosts to survive, spending part of its life on 5-needled pines and the other on Ribes. Infection of pines may result in branch mortality, top kill, and tree mortality.

Spores (aeciospores) are produced by the fungus in the spring on pine bole or branch cankers. They are wind-disseminated to Ribes where they infect the leaves. Spores (urediospores) produced in orange pustules on the underside of the leaves re-infect Ribes throughout the summer, resulting in an intensification of the rust. Another spore stage forms on Ribes leaves in the fall. These spores (basidiospores) are wind-disseminated to pines and infect current year needles. Following pine infection, the fungus grows from the needle into the branch and forms a canker. After 2 or 3 years, aeciospores are produced on the cankers and then spread to Ribes to continue the cycle. Although blister rust may spread hundreds of miles from pines to Ribes, its spread from Ribes back to pines is usually limited to a few hundred feet.

Environmental conditions are critical for successful infection and limit the disease in most years. Abundant moisture and cool temperatures favor infection of both hosts, and must coincide with spore dispersal for infection to occur. At least 48 hours with a saturated atmosphere and a temperature near 20°C are needed for infection of pines. In California, the sites where these conditions frequently occur are usually in cool moist areas such as stream bottoms or around meadows.

When these years of favorable environmental conditions (wave years) occur, high incidence of infection can result. Wave years have occurred in northern and central California at approximately ten-year intervals in the past. As one moves to less favorable sites for rust, the frequency of wave years decreases.

Active branch cankers enlarge annually as the fungus invades additional tissues and moves toward the bole. Branch cankers within 24 inches of the bole will eventually reach the bole and form cankers. Bole cankers that girdle the stem kill the tree above the canker. Cankers whose closest margins are more than 24 inches from the bole will usually die out before reaching the bole, and only branch flagging will occur.

Western Gall Rust (Endocronartium harknessii). Western gall rust causes branch galls and trunk cankers on nearly all species of hard pines. The rust fungus produces yellow to orange-colored spores (aeciospores) on the surface of the galls during cool, moist, spring weather. The spores are wind disseminated and can infect other pines directly. Invasion of the cambium through the pine bark by the rust fungus results in the formation of woody galls. Galls on branches are typically spindle-shaded. The galls continue to enlarge and produce new spores each spring until they have girdled and killed the branch or stem. Girdling of branches results in a reduction of tree growth. Trunk cankers deform and reduce the strength of the bole.

Lodgepole Pine Needle Cast (Davisomycella montana). This disease commonly occurs on lodgepole pine in the Sierra Nevada, but does not cause much damage to its host except in localized areas. This needle cast is characterized by the appearance of shiny, black, elliptical fruiting bodies found in groups on dead areas on 2-year-old needles. The dead areas are usually separated from green tissues by an orange-brown band. Spores produced in the fruiting bodies probably infect 2-year-old or older needles. Infection causes browning of needles and defoliation. Heavy defoliation will reduce tree growth, but will seldom kill trees. Many of the needle cast fungi attack only trees weakened by unfavorable environmental factors.

Fir Engraver (Scolytus ventralis). The fir engraver attacks most true firs in western North America. Attacks can result in mortality, top-kill, or patch kill along the bole in firs ranging from large saplings to old-growth. Mortality and top-kill frequently are associated with stress induced by overstocking, drought, root disease, soil compaction, excessive and sudden exposure, heavy dwarf mistletoe infections, and other factors limiting tree health and vigor. Because of the sporadic occurrence of widespread, severe mortality and top-kill and the prevalence of healthy broods in living trees (patch attacks), direct control measures are generally impractical. A healthy vigorously growing stand is the best means of minimizing damage from fir engravers.

Adults fly and attack trees or green fir slash between June and September; larvae, pupae, and adults overwinter under the bark of infested trees. The life cycle takes one year, rarely two. Pitch tubes are not formed as with pine bark beetles, but attacks often are characterized by boring dust in bark crevices along the trunk and pitch

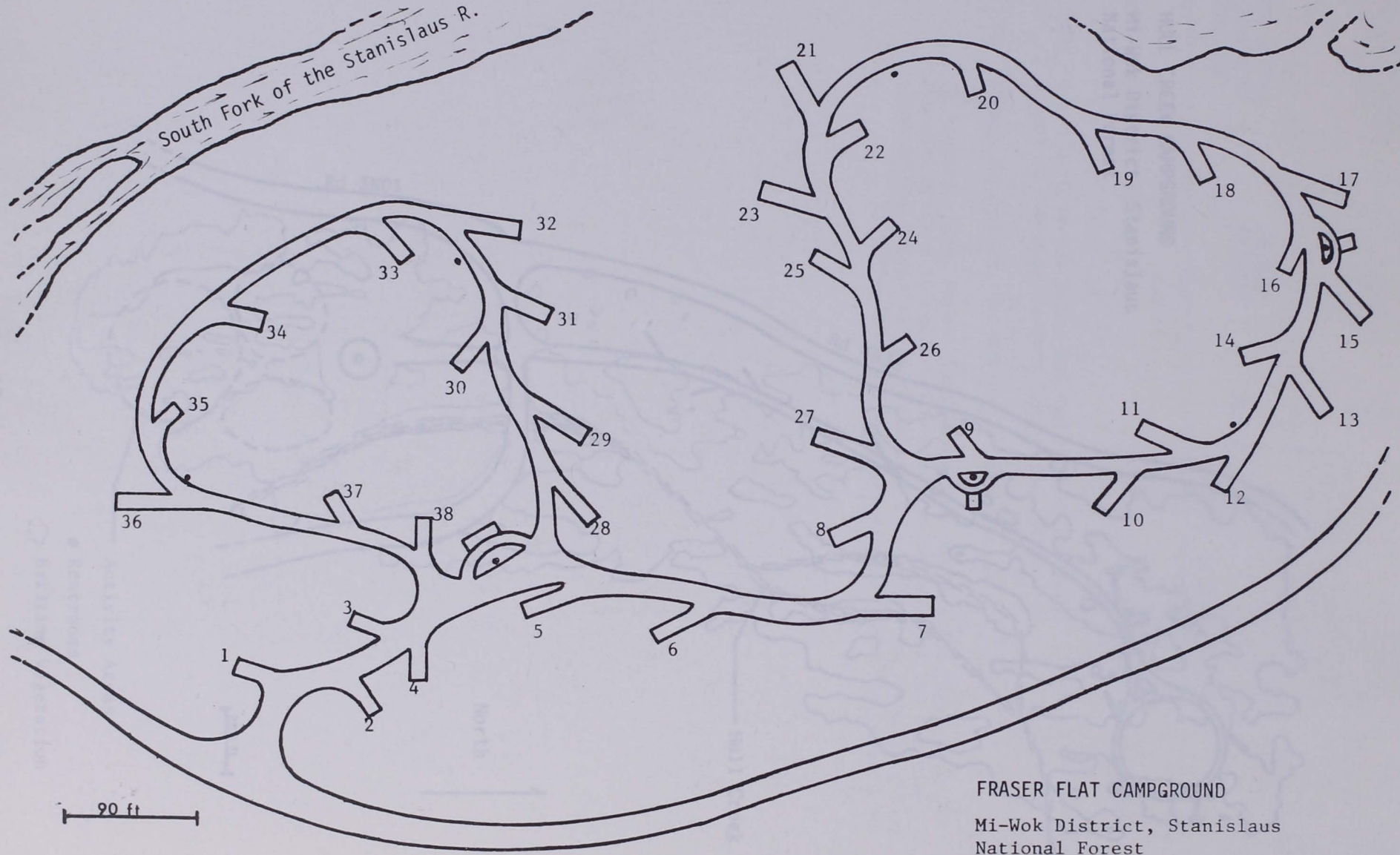
streamers on the mid- and upper-bole. Trees successfully attacked early in the summer may exhibit fading of the foliage by early fall, but those attacked later in the year will not begin to fade until the following spring or summer. The beetles may have emerged by the time the tree fades.

Several other species of Scolytus, along with Pseudohylesinus, may be associated with the fir engraver. These contribute to the damage, as does the roundheaded fir borer, Tetropium abietis, which is also a frequent associate.

The Pine Engraver (Ips spp.). These beetles are common throughout western North America. They are most commonly found attacking freshly cut logs, slash and breakage, and tops and limbs of ponderosa, Jeffrey and lodgepole pines. Attacks on tops and limbs may preceed or occur in conjuction with attacks by Dendroctonus bark beetles. When suitable host material is plentiful, such as slash or drought-stressed pines, large numbers of beetles may develop and aggressively attack healthy green pines. Young pines from 2 to 8 inches (5-20 cm) in diameter and the tops of older trees are the host material most at risk. This is particularly true of densely stocked groups of trees. Fortunately, outbreaks are usually of short duration and seldom last more than one season.

Attacking adults may be found under the bark constructing a typical three or four egg galleries from a central nuptial chamber. These galleries run parallel with the wood grain and assume an I, Y or H pattern. The galleries are kept clear by the adults and consequently the reddish boring dust piles near the entrance holes. The dust is particularly visible on horizontal host material such as blowdown. On vertical trees it catches on bark flakes and crevices, and spider webs. At Hull Creek two or three generations could be expected per year - two summer generations following spring emergence of adults and possibly a third that will overwinter as adults, usually under the bark of recently killed trees.

The factor primarily controlling beetle numbers is the presence of suitable host material. Therefore, management practices should provide the least possible quantity and quality of suitable material. This can be done by utilization (fuelwood) or treating residues in such a way that the inner bark quickly desiccates - lop and scatter, chipping, burning. Deferring slash-producing activities until after July 1 also reduces the likelihood of pine engraver damage. By proper disposal of slash and windthrown material, and maintenance of tree vigor through thinning of dense immature stands, outbreaks in standing trees and top-killing can be minimized.



FRASER FLAT CAMPGROUND

Mi-Wok District, Stanislaus National Forest

• Standpipe

HULL CREEK CAMPGROUND

Mi-Wok District, Stanislaus
National Forest